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THE

ONTARIO WATER RESOURCES

COMMISSION

Twp of N. Cayuga

- Gasoline Contamination of Private Well Supplies

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Township of North Cayuga :
gasoline contamination of a
private well supply / Campbell,
F.R.

80903

MINISTRY OF THE ENVIRONMENT

REPORT ON FIELD INVESTIGATIONS

DATE OF EXAMINATION -

PLACE - Township of North Cayuga

MATTER INVESTIGATED - Gasoline Contamination of a Private Well Supply

AT REQUEST OF - D. D. McLean, Petroleum Resources Section

INSPECTION MADE IN COMPANY WITH - B. Macdonald
S. Sisson

OTHER PARTIES SEEN -

REPORTS TO BE SENT TO - A. K. Watt
J. R. Barr
District Engineers Section
D. D. McLean
A. I. MacIver (2)
Surveys & Projects (4)
Central Records
Cayuga Quarries, Decewsville, Ont.
K & R Redimix, Decewsville, Ont.
W. Williamson
I. G. Simmonds

OTHER RECOMMENDATIONS TO THE OFFICE RE PROCEDURE TO FOLLOW -

REPORT BY FR Campbell
F. R. Campbell, Hydrogeologist.

NOTE: This completed form to be attached to each report.

MINISTRY OF THE ENVIRONMENT

TOWNSHIP OF NORTH CAYUGA - COMMUNITY OF DECEWSVILLE GASOLINE CONTAMINATION OF A PRIVATE WELL SUPPLY

INTRODUCTION

In response to a request from Mr. D. D. McLean, Petroleum Resources Section, Ministry of Natural Resources, an investigation was conducted by representatives of the Water Quantity Management Branch into the gasoline contamination of a private well supply in the Township of North Cayuga. The well is owned by the K & R Redimix Company. The company's operation is located one mile west of Decewsville on Highway 3. The contaminated well is about 250 feet (75m) north of the highway and about 300 feet (90m) east of the Redimix plant, as shown in Figure 1.

A gasoline odour was first noticed in the water from the K & R Redimix well in 1968. Since that time the taste and odour in the water has increased according to personnel at the K & R plant. In 1970, the pump in the K & R well was replaced. Reportedly, the pipes in the well had a coating of a petroleum product and a thin layer of product was seen floating on the water surface in the well. Water from the well is pumped into an underground cistern and from there it is distributed to the plant.

During the field investigation, gasoline odour was noticed in the well, in the cistern, and at the point of sampling in the new plant. No other wells in the area appeared to be affected by gasoline. The locations of pertinent wells and sampling points are shown in Figure 1.

HYDROGEOLOGY

The study area is underlain by massively bedded dolomitic limestone of the Bertie formation which is mined at Cayuga Quarries. This rock is thinly capped locally by coarse grained, friable sandstone of the Oriskany formation.

The soil in the area is classified as Farmington loam, a light brown stony loam with fair to good natural drainage. Haldimand clay is also found in the study area. It is a light brown clay to clay loam with fair to good natural drainage. These soils, along with the underlying clayey sediments on which the soils have developed, attain an average thickness of approximately 10 feet in the study area.

Except near the quarry pit, surface runoff is in an easterly direction into a small creek east of the Smith residence as shown in Figure 1. The creek flows in a north-easterly direction entering the Grand River about two miles north of Cayuga. The creek is not used as a water source in the study area.

Water supplies are obtained exclusively from bedrock aquifers. Wells are about 70 feet in depth with water supplies being found at a depth of about 60 feet. A summary of pertinent water well records is presented in Table 1.

A precise levelling survey of wells was carried out. The results of this survey indicate that ground-water flow is in a northerly direction toward the quarry pit as shown in Figure 1, and in an easterly direction toward the creek. Flow in the northward direction is enhanced by dewatering at the quarry and, as a result, residents in the area have had to deepen their wells as the quarry is deepened. Thus, it is evident that there is a good hydraulic connection between the pit and the local wells. Water from the quarry is pumped periodically over the east wall into the creek. Ground water was seen to be entering the pit through fractures in the west and north-west walls about 10 feet above the floor of the pit.

WATER QUALITY

A series of water samples were collected from wells in the area for chemical analyses. The sampled wells are shown in Figure 1 and the analyses results are presented in Table 2. Gasoline was detected in the water from both of the Williamson wells, the Smith well, and the Cayuga Quarry well in samples collected on April 1, 1971. These results were concluded to be the result of a laboratory error as neither a taste nor an odour of gasoline was noticeable at the time of sampling. This was substantiated by further sample analyses on May 4, 1971, and July 6, 1971, when no gasoline was detected in the water from these wells. Throughout the sampling period only the K & R water system appeared to be contaminated with gasoline. Concentrations of gasoline in this system averaged 16 ppm during the study period.

POTENTIAL SOURCES OF CONTAMINANT

There appear to be several possible sources of gasoline in the area. A 500-gallon underground storage tank was reported to be leaking in 1961 by Mr. Keefer and Mr. Richer, owners of the Redimix plant. This tank, location 3 in Figure 1, apparently was pumped out but left in the ground after the discovery of the leak.

The gasoline storage tanks at the K & R Redimix plant and at Cayuga Quarries were considered as being possible sources of the contaminant. However, pressure tests performed on these tanks under the supervision of the Energy Branch of the Ministry of Consumer and Commercial Relations between August 23rd and August 27th, 1971, indicated that the tanks had no leaks. However, it was noted by Energy Branch personnel that there appeared to be considerable spillage of gasoline in the re-fueling area near the Cayuga Quarries gasoline storage tanks.

No other potential sources of gasoline were found upgradient from the affected well.

Other Sources

An above ground fuel oil storage tank is situated beside the building in which K & R Redimix's cistern is located. The tank has not been used since 1968, but it still contains fuel oil and appears to be leaking. Traces of fuel oil were detected in the cistern water in samples collected in January, 1971.

Cayuga Quarries operates between 40 and 50 vehicles. The oil from these vehicles, which are serviced at the quarry, is dumped over the south bank of the quarry into the pit.

DISCUSSION AND CONCLUSIONS

Gasoline has contaminated the aquifer from which the K & R Redimix well obtains supplies. Concentrations up to 30 ppm of gasoline have been found in this well water. No other wells in the area were found to be affected during the study period.

The affected aquifer is in fractured, massively bedded dolomitic limestone which is overlain by a thin capping of friable sandstone. The rock is covered by about 10 feet of fair-to well-drained lacustrine sediments. The direction of ground-water movement in the aquifer is toward the north and east with discharge to the quarry and the creek. Under these conditions a spillage or leakage of gasoline south of the K & R well would have relatively easy access to the aquifer and the well. In addition, pumping of the K & R well could induce the flow of contaminants toward the well against the prevailing ground-water gradient.

The following calculation approximates the amount of gasoline produced from the K & R well in the past three years since the problem was first noticed. The K & R well has pumped approximately 2,000 gallons per working day or 14.4 million lbs. of water over the past 3 years. If it is assumed that the average concentration of gasoline in the well water over the study period was 16 ppm, approximately 230 lbs. or 30 gallons of gasoline has contaminated the well water over the past 3 years.

Only two potential sources of gasoline were found during the study; 1) the abandoned gasoline storage tank belonging to K & R Redimix that is known to have been leaking and is still in the ground near the affected well, and 2) the spillage of gasoline in the refueling area at Cayuga Quarries downgradient from the affected well.

Either or both of the above potential sources may be the cause of the problem. However, because of the apparent volume of gasoline involved, handling practices at Cayuga Quarries appear to be the more likely source. The contaminant could move to the affected well under the influence of pumping.

The fuel oil in the K & R cistern is likely caused by K & R's leaking fuel oil tank.

ALTERNATE SUPPLIES

1) An attempt could be made to remove the gasoline taste and odour from the K & R well with an activated carbon-diatomaceous earth filter. These devices are available from firms specializing in water-treatment problems.

2) A new well could be drilled to determine whether deeper, uncontaminated aquifers are present in the area. If this method is attempted, it would be imperative to case and grout off any contaminated zones encountered to prevent the downward migration of gasoline to deeper aquifers. There is no guarantee that such a supply exists or that it will not become contaminated in the future.

3) Water could be hauled.

RECOMMENDATIONS

1) Gasoline handling practices at Cayuga Quarries should be substantially upgraded to prevent further spillage in the area.

2) The dumping of used oil into the Cayuga Quarries pit should be terminated. In the future, the oil should be disposed at an approved site.

3) The old underground gasoline storage tank at K & R Redimix should be removed from the ground. The tank should be inspected for leaks and the soils should be inspected for residual gasoline. Any gasoline left in the tank and any gasoline contaminated soil should be removed to a suitable site.

4) The fuel oil tank beside the K & R cistern, which is leaking and not being used, should be emptied and removed.

FR Campbell

Report by: F. R. Campbell, Hydrogeologist,
Surveys and Projects Section,
Water Quantity Management Branch.

Approved by: for T. J. Yakutchik, Supervisor,
Surveys and Projects Section,
Water Quantity Management Branch.

10/1/73
FRC/af

MINISTRY OF THE ENVIRONMENT

Date JAN 72

Prepared by S. Sisson

Table 1 Summary of Water Well Records

NORTH CAYUGA TOWNSHIP

ell No.	Location and Elevation	con	lot	Owner	Driller	year	Well Type	Well Diameter (inches)	Depth (feet)	Static Level (feet)	Pumping Test (gpm) (hrs)	Pumping Level (feet)	Quality	Use	Remarks, Log, etc.
300	650	1N	44	F. WARNER	R. SWAYZE	52	●	6¼	68	25	– –	–	FR	D	0 cl 4 gr 12 ls 68 *65
302	690	1N	47	H. VANDERBURG	MONT BROS	54	●	6¼	35	12	6½ –	12	FR	D	0 to 2 ls 12 flint 28 28 ls 35 *35
303	690	1N	47	H. VANDERBURG	R. SWAYZE		●	6¼	60	27	15-20 –	30	FR	D	0 DUG 35 ls 60 *57
325	680	1S	43	J. HANRAHAN	R.J. GILBERTSON	61	●	6¼	65	30	3 23	60	FR	D.	0 cl 13 ls 65 *60
326	680	1S	46	J. HANRAHAN	R SWAYZE	66	●	6¼	80	56	10-12 1	60	FR	D	0 cl 11 flint 20 ls 80 *71
327	695	1S	48	B. WILLIAMSON	R. SWAYZE	58	●	6¼	72	30	8 ½	65	FR	D	0 pre-drilled 37 ls 72 *35
328	695	1S	48	R. YOUNG	R SWAYZE		●	6¼	63	26.	15 ½	28	FR	D	0 cl 8 flint 30 ls 63 *34

MINISTRY OF THE ENVIRONMENT

TABLE OF WATER ANALYSES

EA OF SURVEY NORTH CAYUGA TOWNSHIP

TABLE 2

DATE JAN 1973

Source and Number	Location and Owner	Date Sampled	Phenols ppb	Mineral Constituents in parts per million (ppm) / equivalents per million (epm)												Alkalinity as ppm $CaCO_3$	Petroleum Product		Hardness as ppm $CaCO_3$	Specific Conductance (micromhos at 25°C)	Remarks
				TDS	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Chloride (Cl)	Sulphate (SO_4)	Free Ammonia (N)	Total Kjeldahl (N)	Nitrite (N)	Nitrate (NO_3)	Iron (Fe)		Gasoline ppm	Fuel oil ppm			
	SMITH	JAN 1971															0	0			
		APRIL 1 1971	15	775	134	31	79	5.4	129	160				0.62		276	1	0			
		MAY 4 1971															0	0			
	K&R CISTERN	JAN 1971															8	Tr			
		MAY 4 1971															30	0			
		JULY 13 1971															18	0			
	K&R WELL (TAP)	JAN 1971															0	Tr			
		APRIL 1 1971	100	590	101	37	46	5.4	106	37				<0.01		314	30	0			
		APRIL 22 1971							78						2.1	404	4	0	504		
		MAY 4 1971															20	0			
		JULY 13 1971															11				

MINISTRY OF THE ENVIRONMENT

TABLE OF WATER ANALYSES

A OF SURVEY NORTH CAYUGA TOWNSHIP

TABLE 2

DATE JAN 1973

Source and Number	Location and Owner	Date Sampled	Phenols ppb	Mineral Constituents in parts per million (ppm) / equivalents per million (epm)												Alkalinity as ppm $CaCO_3$	Petroleum Product		Hardness as ppm $CaCO_3$	Specific Conductance (micromhos at 25°C)	Remarks
				TDS	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Chloride (Cl)	Sulphate (SO_4)	Free Ammonia (N)	Total Kjeldahl (N)	Nitrite (N)	Nitrate (NO_3)	Iron (Fe)		Gasoline ppm	Fuel oil ppm			
	WILLIAMSON WELL #1	APRIL 1 1971	10	805	136	62	32	10	61	161				4.0		394	2	0			
		MAY 4 1971															0	0			
	WILLIAMSON WELL #2	APRIL 1 1971	4	555	114	28	29	3.7	93	68				1.1		276	1	0			
		MAY 4 1971															0	0			
	CAYUGA QUARRIES	APRIL 1 1971	8	795	197	20	19	3.0	55	240				.03		298	2	0			
		MAY 4 1971															0	0			
		MAY 4 1971															0	0			
		JULY 15 1971															0				
	CAYUGA QUARRIES PIT	MAY 4 1971															0	0			

MINISTRY OF THE ENVIRONMENT

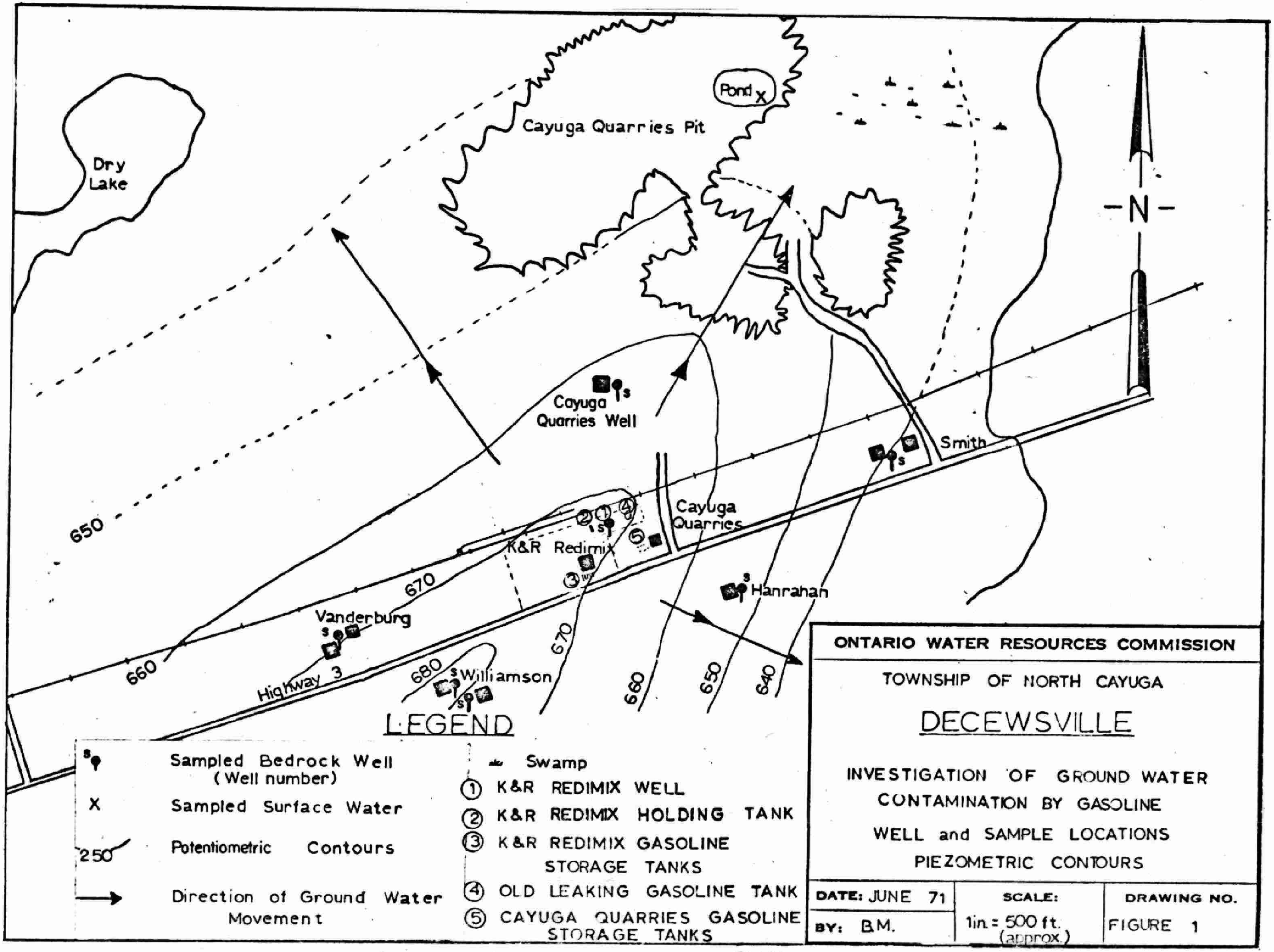
TABLE OF WATER ANALYSES

EA OF SURVEY NORTH CAYUGA TOWNSHIP

DATE JAN 1973

TABLE 2

Source and Number	Location and Owner	Date Sampled	Phenols ppb	Mineral Constituents in parts per million (ppm) / equivalents per million (epm)												Alkalinity as ppm CaCO3	Petroleum Product		Hardness as ppm CaCO3	Specific Conductance (micromhos at 25°C)	Remarks
				TDS	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Chloride (Cl)	Sulphate (SO4)	Free Ammonia (N)	Total Kjeldahl (N)	Nitrite (N)	Nitrate (NO3)	Iron (Fe)		Gasoline ppm	Fuel oil ppm			
	VANDERBURG	APRIL 22 1971							70						.10	249	0	0	372		
		MAY 4 1971															0	0			
		JULY 13 1971															0				
	HANRAHAN	APRIL 22 1971							189						.15	344	0	0	512		
		MAY 4 1971															0	0			
		JULY 13 1971															0				
	PRESS BOARD FROM K&R	APRIL 1 1971															0	0			SOME PETROLEUM HYDROCARBO



LEGEND

- S Sampled Bedrock Well (Well number)
- X Sampled Surface Water
- 250 Potentiometric Contours
- → Direction of Ground Water Movement
- Swamp
- ① K&R REDIMIX WELL
- ② K&R REDIMIX HOLDING TANK
- ③ K&R REDIMIX GASOLINE STORAGE TANKS
- ④ OLD LEAKING GASOLINE TANK
- ⑤ CAYUGA QUARRIES GASOLINE STORAGE TANKS

ONTARIO WATER RESOURCES COMMISSION

TOWNSHIP OF NORTH CAYUGA

DECEWSVILLE

INVESTIGATION OF GROUND WATER
CONTAMINATION BY GASOLINE
WELL and SAMPLE LOCATIONS
PIEZOMETRIC CONTOURS

DATE: JUNE 71	**SCALE:**	**DRAWING NO.**
BY: B.M.	1in. = 500 ft. (approx.)	FIGURE 1

THE

ONTARIO WATER RESOURCES

COMMISSION